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Attention:
Examiner, Timothy C. Vanoy,
Supervisor: Stanley Silverman

An Unit: 1754

Appl.#:09/525,176
Filing date:03/14/2000
Continuation in Part of Application 08/595,040
Now US Patent #6,090,312

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Oct. 4, 2003

Response to Office Action, mailed July/10/2003

Title: PERMREACTOR AND SEPARATOR TYPE FUEL PROCESSORS FOR
PRODUCTION OF HYDROGEN AND HYDROGEN, CARBON OXIDES MIXTURES

This is our response to the last Office Action mailed on July. 10, 2003 with regard to patent application #09/525,176, filled on 03/14/2000. The applicants have followed the instructions of the Petition and Examiner of Last Office Summary Action and have made the necessary amendments into the application for allowance.

The claims under objection (i.e., claims: 138, 143, 145, 146, 148, 149, 156, 159, 163, 164, 166, 167) have been corrected accordingly and are enclosed within.

Abstract of the invention has been corrected accordingly.

The assertion of claim rejections by the examiner according to 35 U.S.C.103(a) is objected by the applicants.

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The applicants have proved the novelty of this invention by the Responses of May 28, 2002 and March 27, 2003.

The applicants have presented to the Patent Office a number of supportive documents and arguments which form the basis for allowance of this patent. The supportive documents and arguments were presented in the responses of May 28, 2002 and March 27, 2003.

Based on these documents the applicants have described a distinct invention in this application and respectfully ask from the Patent Office for the allowance of the Patent.

This application has taken very long period of time for examination by the Patent Office (i.e., more than three and a half years) and the applicants have shown so far with their Responses that the invention is novel.

Reviewing again the novel points of the invention below:

In the Response to Arguments in Page 9 of the Office Action Summary the Examiner claims that the applicants arguments presented in the March 27, 2003 Response are in error.

The applicants disagree with this statement and the written summary described in page 9 (Response to Arguments) of the Office Action Summary of July 10, 2003.

The novel points of the invention raised in the March 27, 2003 response are indeed valid.

This is because the Japanese Patent Document No. 04-182,302A claims a method of manufacturing hydrogen taking place in two different vessels. In the Japanese Patent the membrane 1 is placed in the reactor and the membrane 2 is placed in the separator; between the reactor and the separator there is a cooler and a gas-liquid separator for condensing the steam exiting from the reactor into water.

In the current applicants' patent the two membranes are both enclosed (integrated) within the same reactor (vessel) and all separation operations through the two membranes take place within the same reactor. There is no steam cooling or condensation

at any point within the single integrated reactor (vessel) of the applicants' invention in contrast with the Japanese method. Thus, the applicants' described invention greatly differs from the Japanese method and is not at all obvious.

Argument 2 of the examiner is also not valid. There is a strong difference between the streams treated in the two methods (described in the March 27, 2003 applicants response). The applicants are correct in the description of this difference and the examiner's point is not valid. In the applicants' application membrane 1 separates several components including hydrogen and further membrane 2 in the same reactor separates only hydrogen. In the Japanese patent membrane 1 separates only hydrogen in reactor 100. Membrane 1 rejects steam and hydrogen from reactor 100. Membrane 2 in separator 200 separates hydrogen from the reject stream after the water condensation in cooler 24 (this is a great difference between the two methods).

Argument 3 of the examiner is again not valid. The applicants have described in the detailed description of the invention (within the specification submitted on March 27, 2003) that catalyst can be placed in more than one regions within the integrated reactor of the invention. See pages 10 and 12,13 of the Specification (March 27, 2003), in the description of Fig.1 for the two catalytic regions enclosed within the integrated reactor of the invention. Also see pages 16 and 17 of the Specification (March 27, 2003), in the description of Fig.3 for the two catalytic regions enclosed within the second reactor of the invention. Therefore, the applicants' argument is complete.

Moreover, the examiner claims that claims 138, 141, 143-151, 156-169 recite the use of hydrogen produced by the process set forth in claims 134-137, 139, 140, 142, 152-155, 170-173. However, this is wrong because most of these claims recite the use of several components in the reject streams exiting from the integrated membrane reactor (i.e., claims 138, 141). These components include mainly mixtures of hydrogen and carbon monoxide or hydrogen and carbon dioxide but not only hydrogen as the examiner claims.

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Moreover, several other distinctions of the invented process from previous art including this Japanese document are summarized in a detailed manner in our Response to Office Action mailed into USPTO on May 28, 2002. These distinctions are maintained by the applicants and form the basis for the novelty and subsequent allowance of the invention as the applicants petition by the USPTO.

Moreover, this application is a continuation in part of a previous patent #6,090,512 issued on July 18, 2000.

According to the petition decision of July 1, 2003 all claims presented on March 28, 2003 and the claims remaining in the amendment dated Nov. 1, 2002 (i.e., claims #134-181) need to be allowed based on this Response.

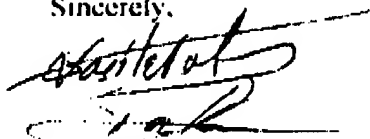
Enclosed: Amended Claims 134-181

Amended Abstract

Amended Figures 6-9, 11, 12

Responses to Office Actions of May 20, 2002 and March 27, 2003 with Arguments listed (*Attachments 1 and 2*)

Sincerely,



Dr. Savvas Vasileiadis, Ph.D.

Dr. Zoe Ziaka-Vasileiadou, Ph.D.

Chemical Engineering & Technology

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